

**TITLE:** Muscle Exerciser And Toner Device With Microprocessor Controlled Multiple Workouts.

#### **CROSS REFERENCE TO RELATED APPLICATIONS**

##### **U.S. PATENT DOCUMENTS**

5,575,761	11/1996 Hajianpur
5,857,984	01/1999 deBoer et. Al.
6,093,164	07/2000 Davis

#### **BACKGROUND OF THE INVENTION**

##### **Field Of Invention**

**[0001]** This invention relates to the field of exercising and weight loss equipment. In particular, it addresses the issue of exercising equipment that can help loose weight and tone muscles of one's body without doing actual physical exercise.

##### **Description of Prior Art**

**[0002]** Efficiency of an exercise depends on two main parts: intensity and timing. Intensity characterizes how hard one moves muscles to make them grow or burn body fat. Timing is important to allow muscles to rest and work in a cycle that is beneficial and not detrimental to body.

**[0003]** In today's busy life, many people ignore the need to exercise due to lack of time, boredom or health conditions. This triggered appearance of some devices that claim to burn fat without need of actual exercising. One existing device uses electric pulses to stimulate body fat tissues. This does not put any hard strain on muscles, is very inefficient and may have an effect (if any) after a very long time. Only actual physical movement of a muscle will efficiently stimulate fat loss.

**[0004]** Some other devices use vibration (Patents 5,575,761 and 5,857,984), but they are used for therapeutic treatments and lack timing requirements of an efficient exercise as defined above. Their vibration effect is not timed; therefore, the device cannot be used as an efficient exercise device. Other devices use vibration as an alert signal ( Patent 6,093,164).

#### **SUMMARY OF INVENTION**

**[0005]** Device in the present invention was designed and built to satisfy the requirements of a real exercise and address deficiencies of the previous designs. The device uses timed mechanical vibrations to make muscles move and thus stimulate body fat burning without having to perform any of the actual physical activities. It uses specially formulated workout timing to achieve the effect of muscle toning and fat burning. Also, the device works with minimal user involvement. One only has to put the devices on one or many body parts, set the workout number and continue doing whatever he or she was doing. The device acts as a warm-up and exercise device. After turning it on, the device automatically runs the workout cycles consisting of vibration and rest periods. After the workout is over the devices shuts off automatically and stays in a standby mode.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0006]** The preferred embodiment and electronic design of the invention, which illustrates all its features is shown in the figures below. The figures demonstrate the novelty of the invention and are for illustrative purposes only. The drawings include the following figures (Figs.) with like numerals indicating the like parts:

Fig. 1 is simplified perspective or isometric view of the device depicting its indicators and controls.

Fig. 2 is a cross sectional assembly view taken along line 1-1 of Fig. of the device.

Fig. 3 is a cross sectional assembly view taken along line 2-2 of the device.

Fig. 4 is a simplified perspective or isometric view of a belt used to wear the device.

Fig. 5 is a simplified perspective or isometric view of locations where the device can be worn. Plurality of identical devices are illustrated one of which has an exploded view.

Fig. 6 is an electronic assembly diagram, which depicts placement of electronic components and a motor.

Fig. 7 is an electronic circuit schematic diagram of the device.

## DETAILED DESCRIPTION OF THE INVENTION

### Introduction

**[0007]** The device uses specially timed vibrations to exercise muscles and burn body fat without a need to perform an actual physical exercise.

**[0008]** As shown in Figs. 1,2 and 3, the device module 9 is contained within a plastic enclosure 2. It has an ON/OFF switch 7, which applies or cuts off power from a battery 12 to the device. A regular coin cell type battery can be used. Sliding switch 7 to ON position turns on the device 9 and starts Workout level No.1. The workout levels are described later in the text. Once the device 9 is turned on, the vibration begins and the first of three Light Emitting Diodes (LEDs) 6 lights up. Pressing the pushbutton 8 once will change the operation to Workout level No. 2 and two LEDs 6 will light up. Pressing the pushbutton 8 twice will switch the device 9 to Workout level No. 3 and all three LEDs 6 will light up. Pressing the pushbutton 8 a third time will switch back to Workout level No.1 and the cycle repeats. After the workout is completed the device 9 goes into a SLEEP mode. In SLEEP mode, all three LEDs 6 and the vibration process are turned off. During the SLEEP mode, the device 9 consumes 0.5 microamperes of current. This extends battery life and eliminates the need for the user to turn the device OFF. The device is turned back on to Workout level No. 1 when the user presses the pushbutton 8 once while the device is in SLEEP mode. Also, the user can slide the switch 7 to the OFF position and then ON again to resume workout.

**[0009]** The device 9 attaches to a belt 24 with a Velcro material 13. The belt 24 is made out of an elastic material, which is shown in Fig. 4. The belt 24 has Velcro strips 13 on it to allow adjustment for the different sizes of people. The device 9 attaches to the belt 24 with a Velcro strip 13, which is glued to the body 2 of the device 9. The device 9 can be placed on different muscles of the body: arms, thighs,

stomach and calves as shown in Fig 5. The user wraps the belt 24 around the body part he wants to exercise. The device 9 module works an area of 3-5" in diameter.

**[0010]** The construction of the device module is shown in Figs. 1,2 and 3.

The motor 15 and Printed Circuit Board (PCB) 14 are mounted in the plastic enclosure 2. The motor 15 is connected to the PCB 14 using two wires 16. The PCB 14 contains a microprocessor 17, a capacitor 19, three LEDs 6, a pushbutton switch 8, a slide switch 7 and three resistors 18. The motor 15 has an eccentric weight 20 on its shaft that causes it to vibrate during operation. The motor 15 is mounted in a plastic holder 21, which is a part of the cover plate 22. Cover plate 22 closes the vibration cavity of the device 9. Cover plate 23 closes the area of the device 9 where the battery 12 resides.

**[0011]** The electronic circuit shown in Fig 7 operates as follows: A battery 12 (VB) supplies power to the circuit by closing the slide switch 7 (S1). The microprocessor 17 (U1) reads a voltage from the pushbutton switch 8(S2) and controls when the motor 15(M1) and LEDs 6 (D1, D2, D3) turn on and off. Pressing down pushbutton switch 8(S2) changes the timing operation of the motor 15(M1) and LEDs 6(D1, D2, D3). The capacitor 19(C1) is used to stabilize and filter the microprocessor 17(U1) voltage. Resistors 18 (R2, R3, and R4) are used to limit current in LEDs 6(D1, D2, D3) to prolong battery life. Microprocessor 17 runs a program that follows a special algorithm designed to provide a maximum efficiency workout. Also, the microprocessor 17 puts the device 9 into SLEEP mode and turns off the motor 15 and LEDs 6. The program uses the microprocessor's 17 internal oscillator and pull-up resistors to reduce component and assembly cost. In addition, the program uses microprocessor's 17 SLEEP mode to put it in a standby state and prolong battery 12 life.

**[0012]** The timing of the three workout levels, pre-programmed in the microprocessor, are analogous to those of standard workouts. The timing has been selected based on exercise literature and consultation of personal trainers, physical therapists and physicians. The workouts are set up as follows:

Workout No.1: Single set intensity; 6 cycles of motor on for 1 minute (equivalent to 10-12 reps per set), then motor off for 1 minute (rest)

Workout No. 2: Superset set intensity; 4 cycles of motor on for 3 minute (equivalent to 20-24 reps per set), then motor off for 1 minute (rest).

Workout No. 3: Triset set intensity; 3 cycles of motor on for 4 minute (equivalent to 30-36 reps per set), then motor off for 1 minute (rest)

**[0013]** The computer program was written using MPASM assembler language available from Microchip Technology Inc. The microprocessor 17 used was PIC12C508 series. Brief operation of a program is as follows: The program starts with microprocessor OPTIONS set to "wake up" on signal change in pin GP3, enable weak pull-ups and use the prescaler for timer module. Initially, the microprocessor is in SLEEP mode. If switch 7 slides to position ON or a pushbutton 8 is pressed down, this causes the microprocessor 17 to wake up and activate Workout level No.1 with a preset ON/OFF timing for the motor 15. The microprocessor 17 counts how many times pushbutton 8 has been pressed. The first pressing changes timing to Workout No. 2 timing, the second pressing changes to Workout No. 3 timing and the

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third pressing changes to back to Workout No. 1. After the workout is over, the microprocessor 17 goes back to SLEEP mode. The program uses a 50 second delay subroutine and a macro to count number of pressings of the pushbutton 8.



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[illegible]

```
movlw    ON_CYCLES_CNT_3
movwf    ON_CYCLES_CNT
movlw    LED123_M_ON           ; new REGIME will always start ON
movwf    TRIS_MOT_ON
movwf    GPIO
tris    GPIO
retlw    0x0f
```

```

movlw 3 ; set count to 3 again
movwf REG_COUNT
movlw MINUTES_ON_1
movwf MINUTES_ON
movwf MIN_ON_CNT
movlw MINUTES_OFF_1
movwf MINUTES_OFF
movwf MIN_OFF_CNT
movlw ON_CYCLES_CNT_1
movwf ON_CYCLES_CNT
movlw LED1_M_ON ; new REGIME will always start ON
movwf TRIS_MOT_ON
movwf GPIO
tris GPIO
retlw 0x0f ; if 0x0f upon return, exit delay
endm

```

```

;~~~~~ End MACRO def ~~~~~

```

```

program
    org 0x00 ;Effective Reset Vector
    movlw SET_OPTION
    OPTION
    btfsc STATUS, GPWUF
    goto START
    goto TO_SLEEP

```

sleep  
nop

```
movlw SET_OPTION
OPTION
movlw 0xff
movwf GPIO ; set outputs to HI to turn OFF
tris GPIO ; turn OFF output/MOTOR
```

```

movlw    3                                ; one more than should be
movwf    REG_COUNT
;set     REGIME_1
movlw    MINUTES_ON_1
movwf    MIN_ON_CNT
movwf    MINUTES_ON
movlw    MINUTES_OFF_1
movwf    MIN_OFF_CNT
movwf    MINUTES_OFF
movlw    ON_CYCLES_CNT_1
movwf    ON_CYCLES_CNT
movlw    LED1_M_OFF                        ; initialize for OFF mode
movwf    TRIS_MOT_OFF                     ; always one LED on and motor off for 1 min
movlw    LED1_M_ON
movwf    TRIS_MOT_ON
movwf    GPIO
tris     GPIO                             ; W still has the MASK

```

```
decfsz    MIN_ON_CNT,F    ; keep on running MINUTES_ON
```

```
goto KEEP_ON
goto TURN_OFF
```

```

nop
movf TRIS MOT OFF,W

```

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```

movwf GPIO ; set outputs to HI to turn OFF
tris GPIO ; turn off output/MOTOR
movf MINUTES_ON, W ; reset ON count
movwf MIN_ON_CNT

decfsz ON_CYCLES_CNT, F
goto KEEP_OFF
goto DONE

KEEP_OFF    nop

decfsz MIN_OFF_CNT, F
goto LOOP_OFF
goto TURN_ON

LOOP_OFF    nop

call delay

xorlw 0x0f ; check if return was 0 or 0x0f
btfsc STATUS, Z ; if it was 0x0f restart loop
goto LOOP_ON
goto KEEP_OFF
nop
movf TRIS_MOT_ON, W
movwf GPIO ; set outputs to HI to turn OFF
tris GPIO ; turn off output/MOTOR
movf MINUTES_OFF, W ; reset OFF count
movwf MIN_OFF_CNT
goto LOOP_ON

TURN_ON

DONE        movlw 0xff
            movwf GPIO ; set outputs to HI to turn OFF
            tris GPIO ; turn OFF output/MOTOR
            goto TO_SLEEP

;*****
;* This routine is a software delay. *
;* Fosc = 1/Tosc; Tcycle = 4 x Tosc *
;* Delay = TEMP1xTEMP2xTEMP3xTcycle*3 ~= 50 sec *
;*****

delay
    movlw DELAY_ALL ; in final use 0xFF
    movwf TEMP1 ; TEMP1 = 255
    movwf TEMP2 ; TEMP2 = 255
    movwf TEMP3 ; TEMP3 = 255

DLOOP
    decfsz TEMP1, F
    goto DLOOP
    decfsz TEMP2, F
    goto DLOOP
    check_reg_macro ;check regime macro

DLOOP_CONT
    decfsz TEMP3, F
    goto DLOOP
    retlw 0
;*****end delay sub *****
end

```